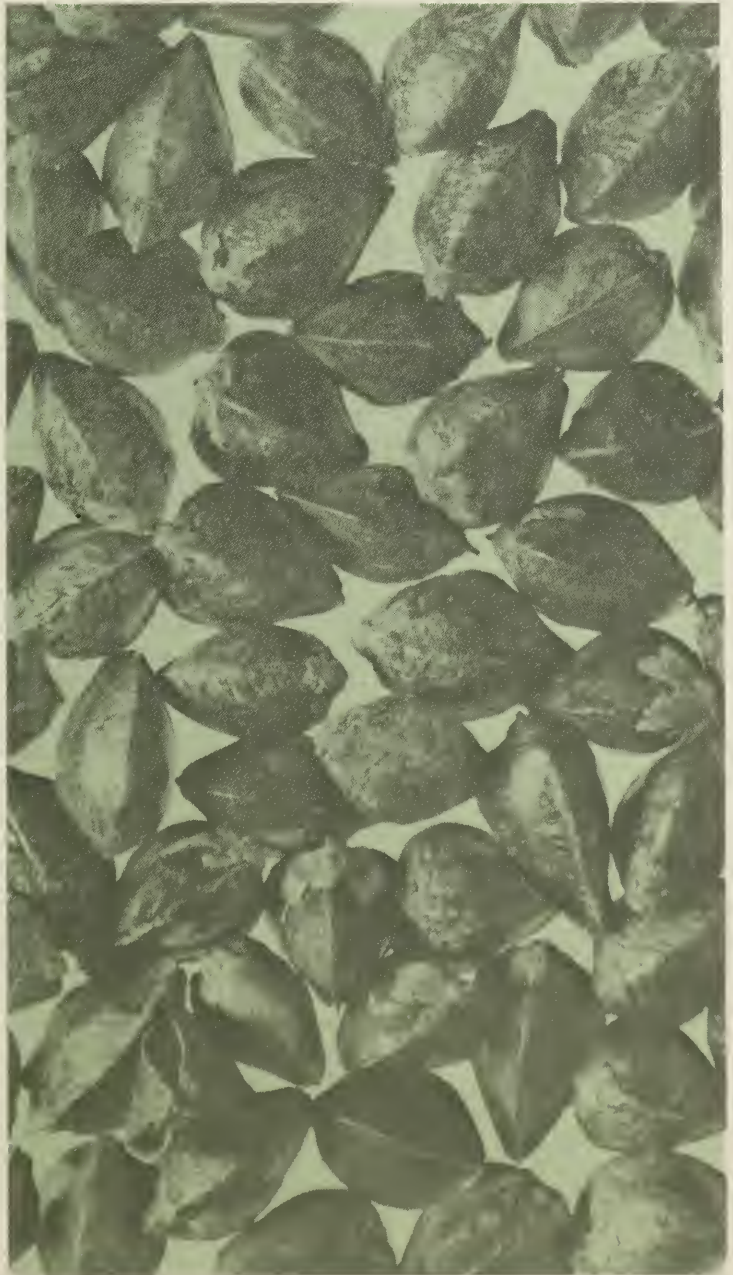


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Growing Buckwheat

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Introduction

Buckwheat has been grown in Canada as a minor crop for many years. In the past decade, however, it has become an important cash crop, occupying approximately 35 500 ha (87 700 ac). In 1970, 61 430 ha (151 800 ac) were seeded. Manitoba records the highest production in Canada, with a 10-year average of 21 930 ha (54 190 ac) and a 1-year high of 32 400 ha (80 100 ac).

Buckwheat is grown primarily to produce seed for human consumption. Although it is not a true cereal, it is often classed as one because the methods for handling the crop and its grain are similar to those for cereal crops. It can also be used as a green manure crop, as a smother crop to crowd out weeds, and as a source of buckwheat honey. About two-thirds of the Canadian buckwheat crop is exported, with Japan being the largest customer. The Japanese grind most of the buckwheat into flour for making noodles and use the hulls from the seed for stuffing pillows.

The buckwheat discussed in this publication is common buckwheat (*Fagopyrum esculentum* Moench). A related species, Tartary buckwheat (*F. tataricum* (L.) L. J. Gaertn.), is cultivated in Eastern Canada but is a noxious weed in Western Canada. Wild buckwheat (*Polygonum convolvulus* L.), a common weed, is more distantly related. These related species do not cross with common buckwheat.

The buckwheat plant

The buckwheat plant is a broad-leaved, erect annual with a single main stem and several branches. It has a shallow taproot system with several branched lateral roots. The root system is less

extensive than those of the true cereal grain plants. The limited root system and large leaf surface combine to make the plant susceptible to wilting during periods of moisture stress.

The stem is usually smooth, grooved, succulent, and hollow. It varies from green to red and turns brown as it approaches maturity. The dark green leaves are heart shaped.

Buckwheat has an indeterminant flowering habit. Dense clusters of showy flowers bloom at the ends of branches or on short pedicels arising from the axils of the leaves. The flowers are usually white, but pink ones occasionally occur. The flowers have five petal-like sepals and occur in two main types. The pin type has long styles and short stamens, and the thrum type has short styles and long stamens. The plants generally do not set seed with their own pollen. Consequently, pollination must occur between plants of different flower types and is usually done by insects such as bees.

Botanically the seed is called an achene. Its hull is triangular and varies from brown to gray to black. The groat, which is the tissue inside the hull, is covered by a thin layer of material. This layer is green when the seed is first harvested and turns reddish brown as the seed ages.

Adaptation

Buckwheat grows well during warm weather, but it is sensitive to high temperatures and hot, dry winds, especially when moisture is scarce. These conditions during flowering can cause flower blasting, which reduces seed set and yield. Buckwheat is susceptible to frost and can be severely damaged by late-spring or early-fall frost. Seeding, therefore, should be delayed until the danger of spring frost is past. Because of its short growing season, only 10–12 weeks, buckwheat is sometimes used as a catch crop in an emergency. It can be grown when wet weather or a late spring delays the seeding of cereal crops or when another crop has failed because of severe weed infestation or poor stands. Buckwheat must be seeded early enough, however, so that the seeds are well formed and nearly mature before fall frost kills the plant.

Although buckwheat is best adapted to well-drained sand or silt loam soils, it grows well under a wide range of soil conditions. It is often grown on heavier soils but should not be planted on poorly drained, saturated soils. The crop also tends to lodge when subjected to high winds or heavy rains and when grown on very fertile soils.

Place in the rotation

When selecting a field for buckwheat, avoid fields previously

planted with wheat, oats, or barley because cereal grains from volunteer plants are difficult to separate from the buckwheat. The crop should follow these three cereals only if the land can be tilled in the fall and again in the spring to germinate and eliminate volunteer growth. Never seed buckwheat on rapeseed, mustard, or sunflower stubble because volunteers from these crops are difficult to control.

Care is needed in selecting a suitable crop to follow buckwheat in the rotation. Because buckwheat seed is easily shattered, volunteer growth often occurs in the field the next year. Volunteer growth of buckwheat in succeeding crops can be controlled by applying herbicides when the buckwheat is in the seedling stage. The crop following buckwheat must be resistant to the specific herbicide applied. Consult your agricultural representatives for the latest herbicide recommendations for your area and choose your next crop accordingly.

As a precaution, wait at least 2 years between buckwheat crops in a rotation. Although disease is not a problem in buckwheat to date, this practice reduces the risk of disease organisms increasing. It also minimizes the mixing of buckwheat cultivars that occurs when volunteers from a previous crop are allowed to grow with the new crop.

Cultivars

The cultivars Mancan, Tempest, and Tokyo are licensed for production in Canada. All three are classed as mid-season types. Although some common buckwheat is also produced, growers should use pedigreed seed to ensure good crop quality and high production.

Mancan buckwheat was developed at the Research Station, Morden, Man. It has much larger seed, thicker stems, and larger leaves than Tokyo or Tempest. Flowers are white although some pink-colored ones do occur. It has dark brown to black seeds, some of which have wings that are paper-like extensions of the hull. Because of its large seed, desirable quality, and high proportion of groat to hull, this cultivar is preferred by the Japanese market.

Tempest has small seed and was developed from a Russian introduction by the Research Station at Morden. It is taller and more finely branched than are the other cultivars. The seeds are gray to light brown.

Tokyo is a combination of two lines developed from a Japanese introduction by the Research Station, Ottawa, Ont. Its seeds are slightly larger than Tempest and are dark brown. It is a vigorous-growing cultivar.

A quantity of common or unlicensed buckwheat is produced

each year. It is usually a mixture of Japanese and Silverhull types and produces small seed. It generally has highly variable plant and seed characteristics.

Canadian buckwheat breeders are developing large-seeded cultivars with reduced height to increase resistance to lodging. These are expected to replace the smaller-seeded cultivars because of the increasing demand for large seed by the Japanese market.

Seedbed preparation

Prepare the seedbed for effective control of weeds, conservation of moisture, and provision of firm soil near the surface. Although shallow tillage in early spring may not be necessary on light-textured soils, it fosters early germination of weed seeds on heavier soils. A second tillage just before seeding kills these weeds. Tillage must be kept shallow to minimize moisture loss, maintain a firm seedbed, and reduce chances of bringing new weed seeds to the surface. Harrowing should then leave the field ready for seeding with a grain drill. Seeding with a discer allows you to combine the three final operations into one.

Date, rate, and depth of seeding

Buckwheat is susceptible to late-spring and early-fall frosts. Tests at the Research Station at Morden have shown that yields are highest when the crop is seeded soon after the risk of frost has passed but decline sharply if seeding is delayed. For example, yields from buckwheat seeded at the beginning of June were as much as double those from seedings made at the end of June. When the crop is used as an alternate to summerfallow, seedings as late as early July sometimes give satisfactory returns. However, because buckwheat requires 10–12 weeks to produce an acceptable crop, late seeding is risky where early-fall frosts are common.

A seeding rate of 40–55 kg/ha (0.75–1 bu/ac) is recommended. The higher rates are suggested for fields where weeds may be a problem. A high plant population helps the crop to compete with weeds. Buckwheat plants branch extensively and are often capable of compensating for thin stands. Therefore, if poor emergence occurs, delay turning the crop down until you are sure the plants will not produce an adequate canopy.

A seeding depth of 4–6 cm is recommended. Although shallow seeding is desirable for rapid emergence, it is important to place the seed in moist soil. A conventional grain drill or a discer can be used for seeding. Seed treatment is not necessary in the prairies.

Fertilizers

Buckwheat responds well to fertilizer when soil fertility is low. A buckwheat crop that yields 1600 kg/ha (30 bu/ac) removes 47 kg nitrogen, 22 kg phosphorus (P_2O_5), and 40 kg potassium (K_2O) from the soil for each hectare planted (42, 20, and 35 lb/ac, respectively). Fertilizing according to the results of a soil test is desirable. Too much nitrogen encourages vegetative growth, which promotes lodging. In most soils the application of phosphorus is likely to produce a consistent increase in yield. For best results, phosphorus should be sidebanded 2.5 cm to the side and 2.5 cm below the seed. If fertilizer is applied with the seed, rates should not exceed 7 kg/ha (6 lb/ac) for nitrogen and 20 kg/ha (18 lb/ac) for phosphorus (P_2O_5) to avoid injury to the seedlings. Nitrogen and phosphorus in excess of these amounts and all potash should be placed away from the seed.

For current information on fertilizer recommendations in each province, refer to the publications that are available on request from either the provincial or federal departments of agriculture.

Weed control

Most weeds are controlled by carefully preparing the seedbed. In good stands of buckwheat the seedlings compete strongly and smother weeds. In thin stands, further controls may be needed if a severe weed problem is anticipated. For the latest recommendations in weed control, consult your local agricultural representative.

Pollination

Buckwheat is naturally cross-pollinated, with insects as the main pollinating agents. Honey bees and leafcutter bees are effective pollinators. Besides increasing seed set and seed yield, honey bees return an added value in the honey they produce. Buckwheat honey is darker than No. 1 White Honey and has a distinctive flavor.

Flowering begins 5 or 6 weeks after the seed is sown and continues for at least a month, frequently until frost. An arrangement with an apiarist can help maximize pollination of the crop to your mutual benefit. If you advise him where you intend to seed buckwheat, he can then place his colonies to maximize buckwheat yield and honey production and to avoid undesirable mixtures of honey from different crops.

Insects and diseases

Problems with insects and diseases are not common. Cutworms and aphids can cause damage, and control occasionally becomes necessary. Aster yellows and leaf spot diseases some-

times occur but seldom cause extensive losses. If a severe insect problem develops, consult your local agricultural representative.

Harvesting and threshing

Buckwheat is usually swathed first, then harvested with a combine after the plants and seeds have dried. Because buckwheat has an indeterminate growth habit, flowers, green seed, and mature seed are present on the plant at the same time. Often much of the total yield is produced in the cooler weather just before frost, and early swathing can reduce yield. If plants are flowering profusely and there is a heavy set of green seeds developing, it is best to delay swathing. Generally, if flowering is almost finished, swath when 75% of the seeds are mature. In the event of frost, swath the crop promptly. Seeds shatter easily once the plants dry and lodging can occur soon after severe frost. Swathing in the early morning when dew is present, or in damp weather, helps keep losses due to shattered seed to a minimum. The reel speed should correspond to ground speed to reduce shattering. Careful handling is very important because shattering losses of up to 22% have been recorded on experimental plots.

Combine the crop when the seed in the swath contains less than 16% moisture. The pickup speed should be reduced to match ground speed to reduce shattering. A draper type of pickup causes less shattering than the drum type. To minimize seed breakage the cylinder speed should initially be reduced to about one-third that used for cereal grains, and the concaves set to approximately 13–16 mm in the front and 9 mm at the rear. If breakage is excessive, reduce the cylinder speed further or increase concave clearance. Set the upper sieve initially at 16 mm and the lower sieve at 8 mm. The lower sieve can then be opened gradually to the setting that does not allow excessive foreign material to pass through. This procedure ensures that the amount of seed entering the return is minimized, thereby minimizing seed breakage.

Buckwheat normally yields 800–1000 kg/ha (15–19 bu/ac) although yields of 2000 kg/ha (38 bu/ac) or higher have been produced under favorable conditions in Manitoba.

Storage

A moisture content of 16% or less is necessary for safe storage of buckwheat. If the seed requires drying, the temperature should not exceed 43°C. This temperature limit applies to seed for both seeding and commercial use. Do not store grain for sale the next year because the Japanese market demands buckwheat from new crops only. Mixing seed from old and new crops reduces marketability. Mixtures of old and new seed can be easily detected

Table 1. GRADES OF BUCKWHEAT (Canada)

| Grade name | Standard of quality | | | Maximum limits of foreign material | | |
|--------------|----------------------------------|----------------------|--|------------------------------------|--------------|---------------------|
| | Minimum kilograms per hectolitre | Variety | Degree of soundness | Matter other than cereal grains | Other grains | Total not to exceed |
| No. 1 Canada | 61 | Any domestic variety | Reasonably sound, cool and sweet | Practically free | 1% | 1% |
| No. 2 Canada | 58 | Any domestic variety | Reasonably free from damage, cool and sweet | 1% | 2½% | 3% |
| No. 3 Canada | 54 | Any domestic variety | Excluded from the preceding grades on account of damage; may have a ground or grassy smell but not musty | 2% | 5% | 5% |

because the light green color of the layer just under the hull in freshly harvested seed gradually changes to reddish brown during storage.

Marketing

Buckwheat is marketed according to grades established under the Canada Grain Act as shown in Table 1. Most of the buckwheat crop is exported and the rest is used domestically. The export market has recently undergone many changes, with Japan now providing the largest market for Canadian buckwheat. Future prospects look good for the buckwheat grower. However, for an assured market and a guaranteed price, a sales contract should be obtained.

Uses

Buckwheat is most commonly grown as a grain for human consumption. It has also been grown for livestock and poultry feed, as a green manure crop, a companion crop, and a smother crop, and as a source of dark buckwheat honey. Although the grain and straw can be used for livestock feed, the total nutritive value is lower than that of cereals.

Consumption of buckwheat in Canada accounts for about one-third of the crop. It is used in pancake mixes, breakfast cereals, poultry dressing, and certain breads and ethnic dishes.

In Japan, buckwheat flour is mixed with wheat flour in the manufacture of buckwheat noodles. The buckwheat flour must be milled from fresh seed to have the desired flavor. The Japanese market, therefore, does not accept mixtures of buckwheat seed from old and new crops.

The protein in buckwheat flour is of exceptionally high quality because it contains a considerable amount of lysine, a protein component deficient in cereal products. Buckwheat is rated as one of the best sources of high biological value protein in the plant kingdom.



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CONVERSION FACTORS

| Metric units | Approximate conversion factors | Results in: |
|--------------------------------------|--------------------------------------|------------------|
| LINEAR | | |
| millimetre (mm) | x 0.04 | inch |
| centimetre (cm) | x 0.39 | inch |
| metre (m) | x 3.28 | feet |
| kilometre (km) | x 0.62 | mile |
| AREA | | |
| square centimetre (cm ²) | x 0.15 | square inch |
| square metre (m ²) | x 1.2 | square yard |
| square kilometre (km ²) | x 0.39 | square mile |
| hectare (ha) | x 2.5 | acres |
| VOLUME | | |
| cubic centimetre (cm ³) | x 0.06 | cubic inch |
| cubic metre (m ³) | x 35.31 | cubic feet |
| | x 1.31 | cubic yard |
| CAPACITY | | |
| litre (L) | x 0.035 | cubic feet |
| hectolitre (hL) | x 22 | gallons |
| | x 2.5 | bushels |
| WEIGHT | | |
| gram (g) | x 0.04 | oz avdp |
| kilogram (kg) | x 2.2 | lb avdp |
| tonne (t) | x 1.1 | short ton |
| AGRICULTURAL | | |
| litres per hectare (L/ha) | x 0.089 | gallons per acre |
| | x 0.357 | quarts per acre |
| | x 0.71 | pints per acre |
| millilitres per hectare (mL/ha) | x 0.014 | fl. oz per acre |
| tonnes per hectare (t/ha) | x 0.45 | tons per acre |
| kilograms per hectare (kg/ha) | x 0.89 | lb per acre |
| grams per hectare (g/ha) | x 0.014 | oz avdp per acre |
| plants per hectare (plants/ha) | x 0.405 | plants per acre |

